

PALEONTOLOGY.—*An acanthodian fish from the lower Permian of Texas.*¹

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While engaged in U. S. Geological Survey field work during the Spring of 1955 Mamay, accompanied by E. L. Yochelson, collected the complete remains of a small acanthodian fish. The specimen and the details of its occurrence seem of sufficient interest to warrant a published account, particularly since, insofar as we are aware, no other complete specimens have yet been recorded from the Permian of the Western Hemisphere.

The fossil was found in an outcrop on the Emily Irish land grant, approximately 18 miles south-southeast of Seymour, in Baylor County, Tex. According to the revised geologic map of Baylor County, published in 1937 by the Texas Bureau of Economic Geology, this outcrop lies within the boundaries of the Belle Plains formation of the lower Permian Wichita group. The exact position of the fossiliferous horizon within the Belle Plains formation is uncertain. However, it is mapped as lying beneath an unnamed limestone member which itself is overlain by the Beaverburk limestone member of Garrett, Lloyd, and Laskey (1930) of the Belle Plains formation. From these facts, the bed is presumed to be a correlative of the Valera shale member, which occupies a position at about the middle of the Belle Plains formation in Coleman County, Tex., 120 miles to the south.

On a cosmopolitan basis, fossil remains referred to the *Acanthodii* present a maximum stratigraphic range of from upper Silurian to lower Permian. Nielsen (1932) has reported fragmentary acanthodian fossils from the lower Permian of East Greenland. However, the youngest previous record of this group of fishes in the United States known to us is from the Middle Pennsylvanian: *Acanthodes* (*Acanthoessus*) *marshi* Eastman (1902) and *A. beecheri* Eastman

(loc. cit.). The newly reported discovery thus provides definite evidence that the distribution of this group of placodermatous fishes is much the same in the Western Hemisphere as in the Eastern.

The fish (U.S.N.M. no. 21318) is scaleless and impressed as little more than a rusty carbonaceous film on a dark grey and very fine-grained shale. Recovered in part and counterpart, the body outline and fin positions are clearly discernible, nonetheless, and the gross characteristics of the form can be determined.

As preserved, probably lacking some small portion of the epichordal lobe of the caudal fin, the specimen possesses an axial length of about 37 mm and a maximum body depth of 4.5 mm. A very slenderly fusiform body habit is thus displayed. Reflecting the general body shape, the head is also slender and long; its length from snout to origin of the pectoral spine apparently contained $4\frac{1}{2}$ times in the overall axial length of the specimen. The position of the orbits are exhibited and a trace of either the preopercular or opercular sensory canal is preserved. Unfortunately, no other structures of the skull or branchial apparatus can be determined.

Fin positions are denoted by the impression of delicate spines which are extremely narrow relative to their lengths. No tissue of this armament remains but the impressions show each to have been marked by one longitudinal groove along the side. Dorsal and anal fin spines are single, situated very far posteriorly with the larger anal one slightly in advance. The heterocercal caudal fin is indicated to be moderately clefted and with the hypochordal lobe appreciably shorter than the dorsal body extension. Neither pectoral nor pelvic spines are preserved in their entirety. The pectoral one, however, is noticeably more robust and presumably longer than the pelvic. The latter is inserted nearer the pectoral appendage than to the anal.

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FIG. 1. *Acanthodes* sp. (U.S.N.M. no. 21318): Photograph of specimen as exposed in lateral view. $\times 4$.

This combination of characteristics is that of the genotypic material of *Acanthodes* from the Rotliegende of Lebach, Germany. While probably distinct from the Middle Pennsylvanian forms from Illinois mentioned above (Eastman, 1902, and Gregory, 1951), no species assignment is made for this specimen from Texas. Woodward (1891) customarily grouped all of the *Acanthodes* from Lebach under *A. bronni* Agassiz. Watson (1937) called attention to the wide differences between the numerous series of Lebach specimens. The variants, however, were left unnamed because of either the difficulty or impossibility of locating the Agassiz types. Therefore there seems to be no adequate basis, as yet, of evaluating material falling within such a range of variation, or for making a specific identification of the presently discussed specimen.

The specimen was found in association with an extremely rich and diverse terrestrial floral assemblage, description of which is currently being prepared for publication by Mamay. The flora is dominated in large part by pectopterid ferns of the type that was prevalent in Late Pennsylvanian coal swamps. However, various callipterids, sphenopterids, *Tingia*-like foliage and *Gigantopteris americana* White also constitute

conspicuous elements in the flora, with lycopside and sphenopside showing only a minor representation.

Although this shale bed contains a great profusion of plant remains, animal fossils are by contrast extremely rare. The most common of these are estherid remains, which occasionally occur in fairly rich local concentrations. However, the fish specimen under discussion represents the only vertebrate fossil found by the collectors although perhaps as much as three cubic yards of matrix was split and carefully examined; furthermore, a large collection made in 1940 by Charles B. Read of the U. S. Geological Survey at the same locality is completely lacking in vertebrate remains.

Both the abundance and condition of the plant material suggest deposition of the enclosing sediments in relatively quiet, undisturbed, fresh or possibly brackish water. Although the matrix is very friable and must be handled carefully, it has been possible to expose many large and unbroken leaf specimens. The state of preservation of this delicate foliage discourages the possibility that it could have been subjected to transportation over considerable distances from its original habitat, or to much agitation in the waters in which it was deposited. It is

quite likely, then, that the fossiliferous bed represents the bottom of a quiet pool or an extremely sluggish stream.

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MAUNA LOA OBSERVATORY

A unique high-altitude observatory on the slope of the Hawaiian volcano, Mauna Loa, was dedicated on June 28 for joint use by the National Bureau of Standards and the U. S. Weather Bureau. Located at a height of 11,134 feet in the Tropics, where the upper atmosphere is very clear and usually of low moisture content, the new observatory offers special advantages for many types of astronomical and upper-air studies. It will make possible continuous observation of atmospheric phenomena with manned instruments in place of the unmanned meteorological balloons that have been used for the most part in high-altitude work.

The dedication ceremonies were arranged by R. L. Fox of the Weather Bureau, and J. B. Cox, president of the Geophysical Society of Hawaii, acted as master of ceremonies. After introductory remarks by Governor S. W. King of Hawaii, J. W. Steiner of the Weather Bureau gave some highlights on the new facility. Ralph Stair and C. C. Kiess of NBS then spoke on research potentials of the observatory and its use in studying the planet Mars. Prof. W. B. Steiger of the University of Hawaii commented on the importance of the observatory to geophysics, and Mr. Fox discussed the past, present, and future of the observatory.

The new observatory is expected to provide valuable data in a variety of fields. Its advantages as a high-altitude observatory are due largely to the fact that it is situated well above the bulk of the dust and moisture contained in the earth's atmosphere. At the latitude of Hawaii a "trade wind inversion layer" usually traps the dust and moisture below about 8,000 feet. Other important advantages are its ready accessibility and relatively warm climate. Most of the other comparable observatory sites are buried in snow during winter and part of the summer. Also, the Mauna Loa observatory has the required altitude without the ruggedness that imparts turbulence to the surrounding air, and it is situated at a key point for studying the huge air masses of the tropics. The chief research results to be expected

are improved long-range weather forecasting and greater knowledge of solar and atmospheric radiation. Because the air masses of the Pacific are responsible for much of the weather that occurs in other parts of the world, data on these air masses may make it possible to forecast conditions in distant places.

There is some evidence that the ozone content of the lower atmosphere in the Tropics is associated with the formation of the large low-pressure areas that produce typhoons. Continuous measurement of atmospheric ozone may thus be of assistance in forecasting typhoons in advance.

The observatory also offers possibilities for study of cosmic rays, total solar radiation, snow crystals, air glows, and possibly radioactive fallout. In July, C. C. Kiess and C. H. Corliss of NBS began a study of the moisture content of the planet Mars under the auspices of the National Geographic Society. They used spectroscopic techniques to investigate the light reflected to the earth from Mars. The advantageous location of the Mauna Loa observatory made it possible to reduce the effect of the earth's atmosphere on the planet's spectrum. During the coming year Ralph Stair of NBS expects to begin a study at Mauna Loa on the distribution of the spectral energy from the sun. Such information will be of value in determining the effect of the sun's rays in connection with high-altitude equipment, space flights, and man-made satellites. This work will also furnish data on the solar constant and information on solar intensities which may be useful in many fields.

The observatory is a concrete-block structure costing \$25,000, and is situated about 2,500 feet below the summit of the mountain. The building contains five rooms in addition to a tower and a broad open platform for observational use. Present accommodations permit the use of the buildings by a maximum of six observers at any one time. A smaller structure was built at the summit in 1951-52, but the limited observations that were taken there were discontinued in 1954